

World-Class Visualizations in GMAT, Phase I

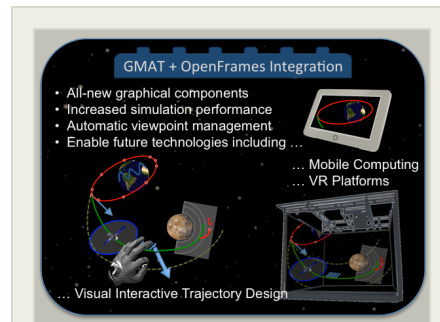
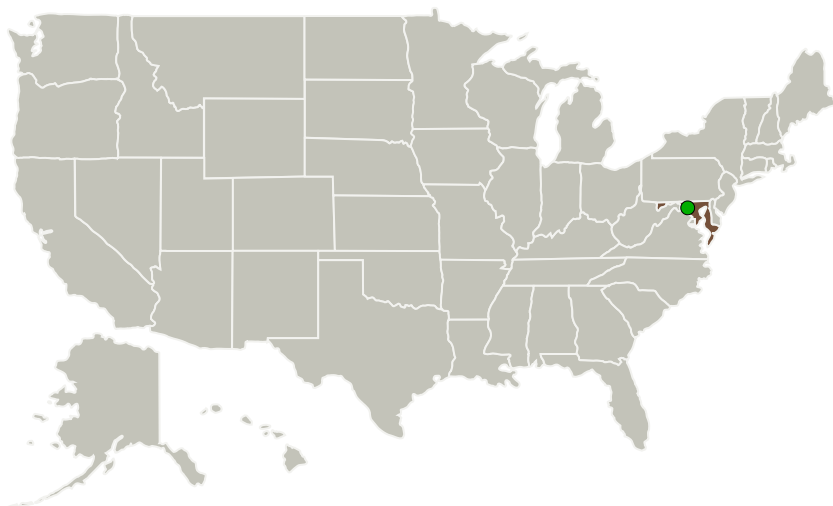
Completed Technology Project (2015 - 2015)



Project Introduction

Today's mission designers rely on state of the art tools with modern GUI elements and real-time 3D interactive graphics to visualize their trajectories and orbit control strategies. One such tool, NASA GSFC's General Mission Analysis Tool (GMAT), offers advanced mission design and optimization capabilities with a flexible GUI. However, its current 3D graphics are lacking in both the quantity and quality of graphical components as well as the maturity of its visualization architecture. Fortunately, GMAT's underlying flexible and Open Source software architecture was designed to facilitate modular improvements. We propose to provide GMAT with world-class visualization capabilities and a graphics architecture that can adapt to future visualization technologies by replacing the existing basic graphics code with the OpenFrames visualization software. OpenFrames is an Open Source API that allows simulations to incorporate high-performance interactive 3D visualizations without requiring significant architecture changes. In this research, we develop comprehensive requirements for GMAT's visualization needs, create a plan to integrate OpenFrames into GMAT, demonstrate a prototype of OpenFrames in GMAT, and compare the performance of OpenFrames to the existing basic visualizations in GMAT. This research will not only bring GMAT visualizations up to par with other mission design tools, such as AGI's STK/Astrogator and NASA JSC's Copernicus, but will also allow GMAT to support cutting-edge technologies such as interactive visual trajectory design and virtual reality environments such as the GSFC CAVE. In turn, this will increase GMAT's user base and increase its utility for future NASA missions, such as Decadal Survey and Discovery class missions that require high-fidelity simulations paired with truly interactive 3D visualizations.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Emergent Space Technologies, Inc.	Lead Organization	Industry	Greenbelt, Maryland
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Project Transitions

▶ **June 2015:** Project Start

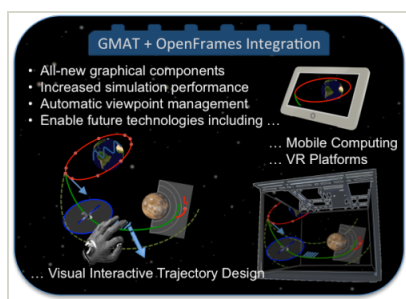
✓ **December 2015:** Closed out

Closeout Summary: World-Class Visualizations in GMAT, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139439>)

Images

**Briefing Chart Image**

World-Class Visualizations in GMAT, Phase I
(<https://techport.nasa.gov/image/125963>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Emergent Space Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

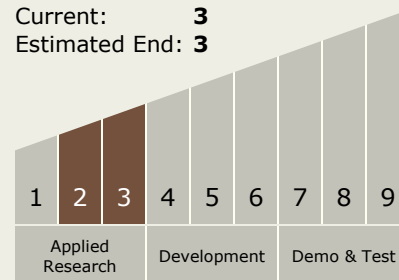
Carlos Torrez

Principal Investigator:

Ravi Mathur

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - └ TX11.3 Simulation
 - └ TX11.3.4 Simulation-Based Training and Decision Support Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System